

1. Having considered the instant application documents the Examiner of the Department of mining and construction engineering holds that the present invention relates to mining useful minerals from subterranean deposits by drilling and using a system of directionally drilled well bores intended particularly for production of gaseous methane from subterranean coal seams. The instant application includes a group of inventions represented in the claim set comprising 6 independent and 21 dependent claims covered by a common inventive concept. One of said inventions is inserted in independent claim 1 and characterizes a method of forming a horizontal subterranean drainage system; independent claims 8, 12, 18, and 19 characterize variants of a process for gas production and independent claim 14 characterizes a method of providing drainage well bores. The present invention is considered by the Examiner in the scope of essential features included by the applicant in the aforementioned independent claims.

Having performed a patent search with regard to claim 1, the Examiner points out that known in present state of the art is a method of forming a horizontal underground drainage system for providing access to a four-sided area of a subterranean zone, said method comprising drilling a substantially horizontal well bore, drilling a first plurality of substantially horizontal well bores spaced somewhat apart from one another from said substantially horizontal well bore towards the periphery of said four-sided area on a first side of the substantially horizontal well bore, and drilling a second plurality of substantially horizontal well bores spaced somewhat apart from one another from said substantially horizontal well bore towards the periphery of said four-sided area on a second opposite side of said substantially horizontal well bore (cf. a textbook "Drilling inclined and horizontal well bores" by A.G.Kalinin et al., Moscow, Nedra

PH, 1997 pp.158-159, Fig.4.17 (in Russian) [1].

The method proposed in claim 1 is characterized in that a horizontal well bore is directed diagonally and extends along a diagonal from a first corner of said four-sided area to the distant corner thereof.

However, provision of a horizontal well bore directed diagonally within the limits of a seam and extending diagonally from the first corner of the four-sided area to the distant corner thereof is known from US Pat. #5,785,133 IPC E 21 B 7/08, of July 28, 1998, specification, Fig.1 [2], which ensures that the horizontal well bore hits a preset point and that said area of subterranean zone is covered by the drainage system.

The Examiner draws the applicant's attention to the fact that a horizontal segment of the directional well bore, aimed at opening a coal seam which may have different shape (e.g., that of a quadrangle, square, etc.) should also have a corresponding geometry so as to provide that the horizontal well bore should hit a preset point on the surface of a productive horizon. In this case offset well bores extending from the horizontal well bore serves as additional drainage bores along which the fluid is fed to the main well bore from individual seam areas, and the shapes of the offset well bores within the coal seam, the well bore profiles, length of the well bores and number of offset bores are selected depending a number of various factors (cf. [1], pp.127-129). A real shape of multihole wells and profiles of boreholes thereof depend on, e.g., a necessity of degassing a coal seam (cf. [1] pp.148-150), that is, a spatial arrangement of a horizontal well bore within the coal seam is (that is, its pattern) is set and determined by calculation.

3. Hence in the Examiner's opinion, the subject matter of the invention as claimed in claim 1, fails to comply with the condition for inventive step since a prior-art technical solution found by the Examiner comprises the features common to the characteristic features of the present invention, and

the effect of the characteristic features on the technical result stated by the applicant is conformed to be a common knowledge, that is, the proposed invention is explicitly obvious from prior art.

The features of dependent claims 2-7 are determined by calculation and as it has been stated hereinbefore, are known from [1], pp.148-150, 156-160, 127.

4. Having performed a patent search with regard to independent claim 8, the Examiner points out that known from the relevant prior art is a process for gas production in a subterranean coal seam, comprising drilling a first substantially vertical well bore intersecting said coal seam, drilling a second offset well bore spaced horizontally from said first well bore, drilling a main horizontal drainage well bore into said coal seam, and flowing gas from said coal seam through said drainage well bore (cf. US Pat. #4,220,203, 1980 [3]).

The method as claimed in claim 8 differs from the known one in that said well bore is logged with a view to finding the depth of occurrence of said coal seam, an enlarged-diameter cavity is provided in said first well bore at the depth of the coal seam, and a second well bore comprises a horizontal section intersecting the aforesaid cavity.

However, a step is known from prior art, whereby logging of the well bore is performed with a view to determining the depth of occurrence of a pay section, coal seam inclusive (cf. "Borehole mining of useful minerals" by Arens V.Zh., Moscow, Nedra Publishers, 1986, pp.103-104) [4].

It is known from drilling technology or that of forming radial channels and boreholes that an enlarged-diameter cavity is formed at the depth of a productive formation in a first vertical well bore intersecting said productive formation, whereas a second well bore or a radial channel comprises a horizontal section intersecting the aforementioned cavity (cf. USSR Inventor's Certificate #1,770,570, 1992 [5]).

5. Thus, in the Examiner's opinion, the subject matter of

the invention as claimed in claim 1, fails to comply with the condition for inventive step since a prior-art technical solution found by the Examiner comprises the features common to the characteristic features of the present invention, and the effect of the characteristic features on the technical result stated by the applicant is conformed to be a common knowledge, that is, the proposed invention is explicitly obvious from prior art.

Moreover, the features of dependent claim 9 are known from [1], p.152, from International Application WO 94/21889 of September 29, 1994 (specification of invention, pp.11-12, Fig.11 [6], and from FRG Patent #19725996, of February 1, 1998, the specification of invention. Fig.1 [7]; the features of dependent claims 10 and 11 being known from USSR Inventor's Certificate #750,108, 1980 [8].

6. Having performed a patent search with regard to independent claim 12, the Examiner points out that known from the relevant prior art is a process for gas production in a subterranean coal seam, comprising drilling a first well bore from the daylight surface till intersection with the coal seam, drilling offset well bore from the daylight surface till intersection with the first well bore, using said offset well bore for drilling the main drainage horizontal well bore into said coal seam, flowing the gas from said coal seam through the main drainage bore, and conducting said gas to the surface through said first well bore (cf. [3].)

The process as claimed in claim 12 differs from the known one in that said well bore is logged with a view to finding the depth of occurrence of said coal seam, an enlarged-diameter cavity is provided in said first well bore; an offset well bore is drilled till intersection with said cavity, drilling a plurality of additional drainage bores in said coal seam each of which intersects said main drainage well bore, draining excess water from the coal seam through said additional drainage bores and said main drainage bore into said cavity, and draining said water from said cavity to the

daylight surface through said first well bore.

However, a step is known from prior art, whereby logging of the well bore is performed with a view to determining the depth of occurrence of a pay section, coal seam inclusive (cf. [4] or, e.g., [1], pp.458-461).

A technical solution is known from the present state of the art according to which an enlarged-diameter cavity is formed in said first well bore and an offset well bore is drilled till intersection with said cavity, water is drained from the coal seam through the main drainage bore into said cavity wherefrom water is drained through first well bore to the surface (cf. [7].) The Examiner also draws the applicant's attention to EP #0819834, 1997, Fig.1 [9] from which a step is also known of forming an enlarged-diameter cavity in the first well bore, and an offset well bore is drilled till intersection with said cavity.

A technical solution is likewise known from prior art, according to which a plurality of additional well bores are drilled in the coal seam, each of which intersects the main drainage well bore (cf. [8].)

As regards draining water from coal seam through the additional drainage bores and the main drainage bore, a step is heretofore known of pumping out fluid through the additional drainage bores and the main drainage bore into an enlarged-diameter cavity and pumping out said fluid from said cavity to the surface through the first well bore (cf. [6], specification and Figs 6, 11).

7. Thus, in the Examiner's opinion, the subject matter of the invention as claimed in claim 12, fails to comply with the condition for inventive step because prior-art technical solutions found by the Examiner comprise the features common to the characteristic features of the present invention, and the effect of the characteristic features on the technical result stated by the applicant is conformed to be a common knowledge, that is, the proposed invention is explicitly obvious from prior art.

The features of dependent claim 13 are known from [8].

8. Having performed a patent search with regard to independent claim 14, the Examiner points out that known from prior art is a method of rendering drainage well bores serviceable in a subterranean coal seam, said method comprising drilling a first well bore extending from the ground surface for a depth of occurrence of the coal seam, drilling an offset well bore spaced somewhat apart from said first well bore and comprising a vertical section extending from the ground surface for a depth smaller than the depth of occurrence of said coal seam, a horizontal section, and a curved section communicating with the vertical and horizontal sections (cf. [3]).

The method as claimed in claim 14 differs from the known one in that said well bore is logged with a view to finding the depth of intersection of the coal seam with said well bore, the diameter of the first well bore is enlarged at the depth of the coal seam for forming a cavity with which the horizontal section of the offset well bore is intersected, use is made of an articulated drill string passing through the offset well bore and the cavity for drilling the main drainage bore in the coal seam, the drilling mud is delivered downwards through the drilling string and returned upwards through an annulus between the offset well bore and the drilling string for removal of the drilling cuttings from the drainage bore, and compressed air is added to the drilling mud in order to reduce hydrostatic head in the drainage bore.

However, a step is known from prior art, whereby logging of the well bore is performed with a view to determining the depth of occurrence of a pay section, coal seam inclusive (cf. [4]).

As it has heretofore been pointed out by the Examiner, a technical solution is known from prior art according to which the diameter of the first well bore is enlarged at a depth of occurrence of the coal seam to form a cavity with which is intersected a horizontal section of the offset well bore, use

being made in forming said horizontal section of drilling equipment (drilling string) which passes through the offset well bore and said cavity for drilling the main drainage bore in the coal seam (cf. [9], Fig.1).

It is known from prior art that when drilling inclined or horizontal well bores use is made of an articulated drilling string and when drilling multihole and horizontally branched well bores, drilling mud is delivered downwards through the drilling string and is returned upwards through an annulus between the offset well bore and the drilling string for removal of the drilling cuttings from the drainage bore (cf. [1], pp. 454-455, 467-468).

Known from drilling technology is also a step of using aerated wash fluids prepared by adding compressed air to drilling mud for reducing hydrostatic head in the drainage bore (cf. the textbook "Drilling oil and gas well bores" by N.G.Sereda et al., Moscow, Nedra Publishers, 1988, pp.133-136, 150-151 (in Russian) [10]).

9. Hence having analyzed the subject matter of the invention as claimed in independent claim 14, the Examiner reveals such prior-art technical solutions that have features common to the characteristic features of the present invention, as well as the fact that common knowledge of the effect of said characteristic features on the technical result stated by the applicant is confirmed, that is, the proposed invention fails to comply with the patentability condition "inventive step", insofar as the invention is explicitly obvious from prior art for those skilled in the art.

The features of dependent claim 15 are known from [10], pp.150-152.

The features of dependent claim 17 are known from [1], pp.458-461, 148-150, as well as from [3].

10. Having performed a patent search with regard to independent claim 18, the Examiner points out that known from the relevant prior art is a process for gas production in a subterranean coal seam, comprising drilling a first vertical

well bore intersecting the coal seam, drilling a second well bore offset horizontally from said first well bore and comprising a horizontal section which is at the same time a drainage bore and intersects said first well bore, conducting the gas from said coal seam through said horizontal drainage section and said first well bore (cf. [3]).

The method as claimed in claim 18 differs from the known one in that a horizontal drainage bore is drilled in the coal seam, said bore extending from a point of intersection of said first and said second well bores and the gas is conducted from the coal seam through the drainage well bore and said first well bore.

However, a technical solution is known realization of which involves drilling in the coal seam a horizontal well bore extending from the point of intersection of said first and said second well bores and the product being drained is conducted from the coal seam through the drainage well bore and said first well bore (cf. [7]).

11. Hence the subject matter of the invention as claimed in independent claim 18 fails to comply with the patentability conditions "inventive step" as it is explicitly obvious from prior art for those skilled in the art.

12. Having performed a patent search with regard to independent claim 19, the Examiner points out that known from prior art is a process for production of formation gas from a gas-dynamic coal formation, comprising establishing a drainage system in said gas-dynamic coal formation and concurrent conducting of water and formation gas therefrom (cf. USSR Inventor's Certificate #1,448,078, 1988) [11].

The process as claimed in claim 19 differs from the known one in that the drainage system comprises a plurality of parallel drainage bores spaced equally apart from one another on the opposite sides of the axis of the drainage system.

However, as it has already been pointed by the Examiner, said drainage system is widely known heretofore (cf. [1], pp.156-160; Figs. 4.16-4.18).



13. Hence the subject matter of the invention as claimed in claim 19 fails to comply with the patentability condition for inventive step, since it is explicitly obvious from prior art for those skilled in the art..

The features of dependent claims 20-22 are known from [1], p.159, those of dependent claim 23 are known from [5], and those of dependent claims 25-27 are determined, as it has been pointed out hereinbefore, by virtue of calculation and are also known from [1] pp.148-149, 156-157, and 127.

In view of the foregoing, the Examiner invites the applicant to present his opinion about the aforestated arguments, to analyze the references cited against hereinabove and give opinion about whether the subject matters of the invention making up a group of inventions comply with the patentability conditions.